



## **DEPARTMENT OF TOXIC SUBSTANCES CONTROL**

### **GREEN REMEDIATION TEAM**

#### **TEAM CHARTER**

**August 2008**

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#### **MISSION**

Green Remediation is an initiative to promote the use of sustainable or “green” technologies and practices in every aspect of site clean-up, from site characterization through implementation of a treatment alternative, to the operation and maintenance (O&M) phases of the project. In comparison to conventional approaches, Green Remediation technologies and practices are intended to minimize indirect, as well as direct, detrimental impacts to the environment from all phases of the clean-up project. This is accomplished through a net reduction in the consumption of natural resources, including non-renewable energy sources, by the reduction or elimination of solid and liquid wastes and of the emission of air pollutants and greenhouse gases generated as remediation by-products, while striving to achieve the established clean-up goals preferentially through the treatment and elimination or minimization of the source of contamination. As part of the larger global sustainability effort to adhere to the principles of enhancing “Economy” and “Equity” as well as the “Environment” (World Commission on Environment and Development, 1987), Green Remediation also includes a recognition of the importance of environmental justice through an increased emphasis upon providing opportunities for job-training and “green” jobs within low-income communities that are frequently in the neighborhood of Brownfields sites.

As part of its mission, the team will develop guidance for use by Remedial Project Managers, Responsible Parties, and consultants in evaluating clean-up technologies and applications proposed as “Green” or sustainable. Recognizing that the determination of a clean-up project’s environmental impact goes beyond a simple projection of the health and safety benefits expected to be achieved, the team will encourage planners and evaluators to apply life-cycle assessment (LCA) approaches in their analyses. The LCA approach considers both the direct and indirect impacts to the ecosystem and biosphere as a whole.

## **PROJECT TEAM DURATION**

The project duration is indefinite. Over time the team expects the scope of its work to evolve and expand as mandates, such as those contained with AB 32 and Executive Order S-3-05, elevate the importance of sustainability principles in the decision-making processes within the department's clean-up programs.

## **GOALS**

- ❖ Review available literature regarding green technologies and LCA techniques, and develop a tool for evaluating and comparing green investigation and remediation technologies patterned after the Treatment Technologies Application Matrix for Base Closure Activities published in November 1994 (target date: November 2008).
- ❖ Invite academic researchers, commercial laboratories, product development companies, consulting firms, other government entities, and Responsible Parties to present Green Remediation technology innovations and approaches to DTSC Clean-Up program staff and the interested public to a series of Green Remediation Symposia (commencing February 2009).
- ❖ Develop a program to train and support DTSC staff in the evaluation of green remediation technologies and practices, including the use of LCA techniques for decision support in the consideration of treatment alternatives (target date: March 2009).
- ❖ Identify legislative changes and regulatory incentives that would encourage the accelerated use of green remediation technologies and practices (target date: August 2009).
- ❖ Develop an outreach plan for educating local government entities, including CUPAS and redevelopment agencies, in the evaluation of green remediation technologies, practices, and life-cycle analysis techniques (target date: August 2009).
- ❖ Green Remediation Pilot Project. Locate a site suitable for development of a pilot project that will utilize green technologies or approaches during some or all phases of clean-up, from site characterization to implementation of the treatment alternative (target date: December 2008).

## **BACKGROUND**

Green Remediation is the name applied to the use of "Green" or sustainable technologies and practices for the environmental restoration of contaminated sites. The scope of the term applies to the entirety of the clean-up effort, beginning with the Remedial Investigation (or RCRA Facility Investigation) phase, through implementation of the treatment remedy (or corrective measure), and continuing throughout the O&M phases of the project, or until deed transfer.

In assessing the impacts from the various phases of a remediation project, the nature and quantity of all inputs and outputs associated with the project are to be evaluated with respect to sustainability criteria that can be applied to each phase. Inputs include personnel resources (labor); consumable materials (process feedstocks, reagents or chemical compounds) derived from virgin natural resources; and other consumable or utilizable natural resources. These resources include water, minerals, land (e.g., open space for erection of a solar generation system, land dedicated to land-fill use, etc.) and non-renewable sources of energy (e.g., fossil fuels) that may be directly consumed in the process of applying or operating the remediation technology; indirectly consumed through site-preparations and construction, transportation of personnel, supplies, materials, waste or by-products to and from the site; as well as that consumed in the manufacture or construction of technology subsystems and components. Outputs include emissions of solid and liquid waste, useable by-products, nuisances and disturbances (noise, odor, loss of view), all of which may be termed “stressors” upon the ecosystem and biosphere.

The goals in applying Green technologies and practices to environmental restoration are:

1. Minimization of consumption and the maximization of reuse of natural resources (minerals, water, land, fossil fuels) and utilization of renewable energy sources wherever feasible;
2. Minimization of production of non-reusable waste, including both hazardous and non-hazardous solid and liquid waste, greenhouse gases ( $\text{H}_2\text{O}$  vapor,  $\text{CH}_4$ ,  $\text{CO}_2$ ,  $\text{O}_3$ ,  $\text{NO}_x$ , halocarbons) and other air contaminants; and
3. Accounting of the consequent contributions these reductions make toward sustainability of the environment through the restoration or improvement of the local habitat, ecosystem, or biosphere.

For evaluating and comparing Green Technologies against traditional technologies, decision-makers may consider qualitative parameters as well as quantifiable and semi-quantifiable factors. Qualitative parameters include effects upon the quality of life of individuals and the community (loss of beauty, odor, noise and other nuisances), job creation and secondary site utilization having a community benefit (e.g., creation of open spaces, recreational opportunities, wetlands, or natural buffer zones), also referred to as the “service capacity” (ITRC, July 2006) of the technology. Quantifiable factors include the costs and benefits associated with the various inputs and outputs that result from implementation of the remediation technology. Semi-quantifiable factors include the time required and the effectiveness of the technology in reaching the established restoration objectives. Comparisons of the quantifiable and, where possible, semi-quantifiable costs and benefits are best made using a life-cycle analyses employing standard, present-valuation techniques.

## **STAKEHOLDERS**

The citizens of California (including communities, property owners, brownfields developers, responsible parties, large and small corporations, etc.), DTSC staff members and the California Environmental Protection Agency Boards, Departments and Offices (BDOs) are the primary stakeholders who will benefit from the deliverables of this project.

## **AUTHORITY OF THE TEAM**

Members of the Team will have the authority to represent their respective DTSC programs and to provide technical guidance in the field of expertise in which they are licensed and/or trained. The Team will also have authority to contact other DTSC and BDO staff to acquire information that may contribute to achieving the goals stated above.

Team members also have the authority to allocate time within their work day to review and comment on proven technologies and remedies documents, attend Team meetings and work on tasks associated with the project. The Team has the authority to circulate draft deliverables at the BDO level for review and comment. The Team will obtain authorization from the Team Sponsor to disseminate final draft deliverables and recommendations developed by the Team. The recommendations formulated and presented in the proven technologies and remedies guidance document(s) will reflect Team decisions reached through a consensus process.

## **PROJECT APPROACH**

Following a review of the technical literature on the topics of sustainability, global climate change, and life-cycle assessment the team will develop:

- Assessment tools (e.g., guidance documents, spreadsheet templates),
- Analytical approaches (e.g., “Life-Cycle Analysis”, “Carbon equivalency”), and
- Evaluation criteria (e.g., stressors, impact and weighting factors, quantitative vs. qualitative)

Once the aforementioned items have been completed, they can be used in determining the sustainability of a technology or practice in quasi-quantified terms. The Team expects that the process of developing the tools, approaches, and criteria will be iterative throughout the duration of the project.

## **TEAM MEMBER EXPECTATIONS, DUTIES AND COMMITMENTS**

- ❖ The Team will initially meet once per month for approximately two hours during the formative stage of the project. As the project progresses, the Team may elect to meet more frequently or for longer durations.

- ❖ Team members will make attendance at these meetings a priority and will provide agenda items for Team meetings as necessary.
- ❖ Team members will review and comment on each deliverable document within two weeks of receipt of the draft and submit comments to the author(s) for incorporation into the document.
- ❖ Completion of team tasks are an essential and integral part of team participation.
- ❖ The team leader will prepare meeting agendas and list of action items for the project.
- ❖ In addition to project discussions held during the time set aside for regularly scheduled team meetings, team members are at all times encouraged to discuss the project and communicate ideas with each other to clarify unresolved issues and maintain project momentum.
- ❖ Team members are expected to keep their supervisors informed about team assignments, commitments and document their progress.
- ❖ Team members are expected to devote time on their own reviewing literature, performing team assignments, including the drafting of language of forthcoming guidance and/or technical papers on the subject of green remediation, and performing peer review of these documents, in addition to sharing resources and technical expertise with other team members and DTSC staff.

## **MONTHLY REPORTS OF PROGRESS**

Team members will send bi-monthly updates of their assignment and progress towards achieving the deliverables. The team leader will compile the progress status made toward accomplishing the team's deliverables in a monthly report that will be provided to the Team Sponsors.

## **REFERENCES**

### **U.S. EPA Web Links**

- [Green Technology: Use Less Resources and Increase Profits](#)
- [Sustainability](#)
- [Green Remediation Clu-In](#)

[Contaminated Land Applications in Real Environments \(CL:AIRE\) and the Sustainable Remediation Forum \(SuRF\) UK](#)

[Sustainable Remediation Forum \(SuRF\) USA, Sponsored by the Dupont Corporation](#)

[ASTSWMO - Greener Cleanups Information Resources](#)

United Nations

Interuniversity Research Centre for the Life Cycle of Products, Processes and Services (CIRAIG)

Society of Environmental Toxicology and Chemistry (SETAC)

ITRC Technical and Regulatory Guidance, "Planning and Promoting Ecological Land Reuse of Remediated Sites," July 2006

1987. World Commission on Environment and Development, *Our Common Future*, Oxford University Press, p. ix